Regulations as to defects of vision which disqualify candidates for admission into the civil or military government services / by J. Fayrer.

REGULATIONS

AS TO

DEFECTS OF VISION

WHICH DISQUALIFY CANDIDATES FOR ADMISSION INTO THE

CIVIL OR MILITARY

GOVERNMENT SERVICES

BY

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PREFACE TO FIRST EDITION.

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THE want of any authorized definition of the Defects of Vision which may exist with or without prejudice to the admission of Candidates to the various departments of the Public Service, has long been felt, not only by official Medical Examiners, but by medical men generally, who, in the absence of any recognized standard, and in ignorance of the visual requirements demanded by various departments for the efficient performance of the duties of each, are unable to form or express an opinion in cases where Ametropia suggests a doubt as to the fitness of the Candidate for the Service.

In the interests of Government and of those seeking admission, it seems very desirable that rules regarding visual qualifications should be laid down: for the Government, because it should be protected, as far as possible, against the admission of persons with unsound eyesight; for the Candidate —or for those on whom he depends—because Ametropia is not always a disqualification, and because it may be necessary to determine at an early age whether the prospect of admission be such as to justify his entering on a special and costly

course of education, which may have to be commenced years before he has to undergo the official medical examination on which his admission to the Service depends.

The object of this little work, therefore, is to lay down rules for the guidance of both Medical Examiners and Medical Advisers, who have, on the one hand, to determine the fitness of the Candidate for admission ; on the other, to advise him at an early stage of his career.

As President of the Medical Board at the India Office, I have for many years experienced the inconvenience above referred to, and am anxious if possible, to remove it. With this view I have submitted the whole question to my friends Messrs. C. N. Macnamara and John Couper, who, having most carefully considered the subject, have drawn up the following brief but simple and complete rules in reference to Visual Defects, and the methods of ascertaining them, which I trust will be found to be of general utility.

The scientific attainments and large experience of the eminent surgeons to whom I am indebted for all that is useful in the following pages, are too well known to need any comment, whilst they are an ample assurance of the practical value of the rules laid down. It has been earnestly desired, in framing these rules, to guard equally the interests of Government and the Candidate ; and with the view of making the subject as complete as possible, it has been thought well to point out not only the Defects of Vision, but the methods of ascertaining them—not with any idea of dictating to Medical Examiners how they should proceed, for of course each will adopt his own method, but for the purpose of indicating the simplest, and

at the same time an efficient, mode of testing the accuracy of vision; and as such I trust this work will be acceptable to all who are interested. The Secretary of State for India in Council has been pleased to sanction these rules for the Indian Service under the following stipulations, that—

"These rules are printed for the convenience of those who may have to conduct medical examinations, and of those who may be intending to become Candidates for any of the branches of the Indian Service to which they refer. But it must be distinctly understood that the Secretary of State in Council, while sanctioning the publication of these rules, reserves to himself an absolute right to reject at his discretion any Candidate whom he may consider to be, for any physical reason, unfitted for the service he desires to enter."*

I desire to express my cordial thanks to Messrs. Macnamara and John Couper, and also to my colleague on the Medical Board, Brigade-Surgeon H. Cayley, whose valuable counsel has been of great assistance. To these gentlemen, it is almost needless to repeat, this work owes whatever merit it may be found to possess.

J. FAYRER.

* Letter No. M. 6560, dated July 8, 1886, from Military Secretary to Government of India, to Surgeon-General Sir J. Fayrer, M.D., K.C.S.I.

In the following pages certain signs and terms are employed which medical men are familiar with, but the meaning of which may not be understood by others.

The sign — is employed to signify a concave lens.
„ + „ „ convex lens.
„ D „ „ dioptry—that is, a lens of one metre (40 inches) focus; a lens of two dioptries is twice the strength of the former, and has a focal length of half a metre. In the dioptric system, which is now universally employed, the lens is numbered by its refracting power, and not, as in the old system, according to its focal length.

At page 9, the meaning of the formulæ referred to in the following work is explained.

Myopia (*near sight*): parallel rays of light are brought to a focus before they reach the retina (p. 11).

Hypermetropia (*over-sight*): parallel rays of light are brought to a focus behind the retina (p. 12).

Emmetropia (*normal vision*): a well-defined image of an object, at an ordinary visible distance, is formed on the retina (p. 10).

Ametropia is any condition of the eye in which parallel rays of light are focussed behind or in front of the retina.

Astigmatism: the refractive power of the chief meridian planes of the eye differ, and so rays of light are not accurately brought to a focus on the retina (p. 14).

Diplopia (*double vision*): the person sees an object double.

Strabismus (*squint*): the optic axes of the eyes are not directed to the same object; there is a want of parallelism in the position and motion of the eyeballs.

Staphyloma: a term denoting a protrusion of the cornea or of the sclerotic.

Retinoscopy (*shadow test*): a test for errors of refraction depending on the apparent movement of the light and shadow thrown on the retina from a concave mirror held about 4 feet from the eye under observation.

Achromatopsia (*colour-blindness*): want of power to distinguish one or more of the primary colours.

Dischromatopsia: a difficulty in recognizing certain colours; one colour is frequently confounded for another; violet is taken for blue, orange for bright red, pink for blue, and so on.

MODE OF CONDUCTING THE VISUAL EXAMINATION OF CANDIDATES FOR THE GOVERNMENT SERVICE.

It is necessary to have a fixed standard by means of which to test the acuteness of vision of candidates desirous of entering the Government Service. For this purpose letters corresponding to the last edition (1885) of Snellen's test-types are to be used: these types are so constructed that the strokes comprising the letters are seen under an angle of 1′, and the whole letter under an angle of 5′ at their respective distances.

The dioptric or metric system is to be used in examining the acuteness of vision possessed by candidates for Government Service. In this system a lens of 1 metre focus is taken as the unit (for all practical purposes 1 metre is equal to 40 English inches). Snellen's types for distant vision consist of rows of letters, each row having above it the distance, in metres, at which it should be read; so that 6 should be clearly deciphered at 6 metres, or about 20 feet. The formula $\frac{6}{6}$ $\frac{\text{distance from type}}{\text{number above type}}$ is designed to represent the acuteness of vision as measured by the proportion between the actual distance at which the type can be read, and the distance at which the type subtends the standard angle of 5′; for instance, $\frac{6}{36}$ indicates that 36 is read at 6 metres; $\frac{6}{5}$, that 5 is read at 6 metres.

The person to be examined is to be placed with his back to the light, at a distance of 6 metres from the test-types, which are hung on the wall or held perfectly upright with a bright light falling on the types. Each eye is to be examined separately; the eye not under observation being

covered with an opaque disc placed in spectacle frames; this is more effectual than if the candidate, or an assistant, close the eye not under examination with his hand. If glasses be employed at the examination, they must be fixed in the spectacle frame, and not held in front of the eye under examination.

It is necessary to have a series of test-types, so that they may be changed during an examination. But the existence and degree of ametropia should be carefully noted after employing not only the types above referred to, but, when necessary, the ophthalmoscope, or the shadow test (retinoscopy), otherwise hypermetropia may be overlooked, or low degrees of myopia mistaken for hypermetropia, and astigmatism for loss of sensitive power in the retina, and *vice versâ*.

If a person can with each eye read 0·5 type at 5 inches and $\frac{6}{6}$ with precision (unless specially trained to pass the examination), he is probably neither myopic, astigmatic, nor has he any serious pathological changes in his eyes—at least, not in his macula; but it is quite possible, if young, he may be hypermetropic to a considerable extent, in which case he would, however, see $\frac{6}{6}$ as clearly with a convex lens. To ascertain the existence of hypermetropia—especially among young people—it is therefore necessary to employ further tests than simply deciphering Snellen's types at their respective distances.

Emmetropia (Refraction normal).

Parallel rays of light are united on the retina. The organ being otherwise healthy, an emmetropic eye can clearly define Snellen's test-types at the indicated distances. Distant

vision is impaired either by a convex or by a concave lens if stronger than can be overcome by an effort of accommodation. By the direct method with the ophthalmoscope, the person's eye under examination being directed to a distant point, and the observer's eye being emmetropic and his accommodation relaxed, if the mirror of the ophthalmoscope be brought close to the eye under examination, a clear and enlarged image of a portion of the fundus is seen, which moves in the same direction as the observer's head. At a distance of a few inches, supposing the observer be emmetropic, he will not be able to see the details of the fundus of the eye with definition. By retinoscopy the shadow is absent or very faint, and if it move, it is in a direction opposite to that of the mirror. If in any doubt the eye should be examined when fully under the effects of atropine.

Myopia.

Parallel rays are focussed in front of the retina; divergent rays alone being focussed on the retina. The myope requires a concave glass to enable him to overcome his error of refraction; the weakest glass with which he sees best is the measure of his myopia and expresses its degree. For instance, when we speak of a person being myopic to the extent of 2 D., we mean that with a concave glass of two dioptries he can see Snellen's test-types at their correct distance. By the direct method of ophthalmoscopic examination the mirror being brought close to the myopic eye, the details of its fundus cannot be clearly defined until a concave lens be placed in front of the observer's eye: the weakest glass with which the details of the fundus can thus be distinctly defined is the measure of the myopia. In high

degrees of myopia the fact must be taken into consideration, that the lens behind the ophthalmoscope does not come as close to the eye under observation as a glass in spectacle frames would do, and by that amount gives an unduly high measure of the myopia. By retinoscopy the shadow moves in the same direction as the mirror; with a correcting concave glass in front of the eye, the image no longer moves with the mirror.

As a rule, a person having 2 D. of myopia can without glasses decipher 24 of Snellen at 6 metres in a good light. Myopia depending on a posterior staphyloma, if not exceeding 2·5 D., and presenting no evidence of active changes in the choroid or retina, is unlikely to increase after the individual is about eighteen years of age. But with a low degree of myopia, if the eye be over-corrected, spasm of the ciliary muscle and temporary impairment of sight may occur, unless the error of refraction be corrected by proper glasses.

Myopia of even 4·5 or 6 D., if unaccompanied with posterior staphyloma or other morbid change, and which can be completely overcome by glasses, is not likely either to increase or to lead to pathological changes in the eyes, if proper glasses be worn.

Hypermetropia.

Parallel rays are brought to a focus behind, and convergent rays alone are focussed on the retina in a hypermetropic eye: the error of refraction may, as a rule, be entirely corrected by proper convex glasses. A young person with good accommodation may be hypermetropic to the extent of 4 D. (manifest hypermetropia), and yet able

to read 0·5 Snellen at 5 inches, and also $\frac{6}{6}$; that is to say, with the types his acuteness of vision may, in a rapid examination, appear normal. In several of the Continental armies neither officers nor recruits are rejected with hypermetropia equal to 6 D., but they are allowed to wear glasses. If this were not the case, it is evident that a young man with a very much lower degree of hypermetropia than 6 D., although when healthy and strong he could perhaps see $\frac{6}{6}$, might, under the fatigues and hardships of a campaign, find his sight utterly fail him, because his muscular power—that is, his accommodation—is for the time weakened. As hypermetropes advance in life their defective sight becomes more manifest, but does not, as a rule, lead to pathological changes in the eye.

By the direct method of examination with the ophthalmoscope (the accommodation of the eye under observation being suspended), the image of the fundus is indistinct, supposing the accommodation of the observer's eye to be at rest. If the observer exert his accommodation, an erect image of the fundus of the eye is seen. The strongest convex glass with which we are able to see a clear image of the fundus by the direct method of examination, is a measure of the degree of hypermetropia. If at 9 inches or farther from the eye under examination, the observer, by aid of the ophthalmoscope, obtain a clear view of a vessel or other portion of the fundus, and if the object move in the same direction as that in which the observer moves his head, hypermetropia exists.

By retinoscopy the image moves in the opposite direction to that in which the mirror is turned. This may also be the case in emmetropia or in slight myopia, if the accommodation be not suspended; but if + 1 D. be placed in

a frame in front of the eye under examination, and the shadow still move opposite to the direction of the movement of the mirror, the case is one of hypermetropia or of hypermetropic astigmatism.

If a convex glass which over-corrects the hypermetropia (say 4 D.) be placed in spectacle frames before the eye under examination, and in front of this be held the weakest concave lens which will enable the individual to read $\frac{6}{6}$, the difference between the glasses will be the measure of the hypermetropia: by this plan the accommodation is encouraged to relax, and a greater amount of manifest hypermetropia is thus got out.

Astigmatism.

In astigmatism there is a difference in the refractive power in the chief meridian planes of the eye. If slight, this error of refraction may be masked by accommodation; but if it exist beyond a limited degree, the rays of light falling on the cornea are not accurately focussed on the retina, and so the image of the object from which the rays proceed is blurred. In not a few instances of hypermetropic astigmatism, when the chief meridians are oblique in direction, the individual by tilting his head to one side can see distant objects more clearly. We not unfrequently meet with instances of both myopia and hypermetropia complicated with astigmatism.

With the ophthalmoscope we find, by the indirect as well as by the direct method, that the optic disc, instead of being circular, is elliptical; the long axis of the ellipse being in one chief meridian by direct examination, and in the opposite meridian by indirect examination. We may thus have

in the same eye the disc appearing horizontally oval when directly examined, and vertically oval when viewed indirectly.

By retinoscopy the shadows may be more or less oblique, or one shadow is clearer and moves more quickly in one meridian than in the other; or it may move with the mirror in one meridian, and against it in the opposite meridian. In the majority of cases of simple or of mixed astigmatism the error of refraction can be corrected, as in myopia and hypermetropia, by means of proper glasses.

Accommodation.

The amount of accommodation is to be tested by measuring the nearest, as also the farthest, point at which the smallest of Snellen's (·5) test-types is clearly read. If the accommodation in each eye be normal, a young person will read ·5 type at 5 inches, and as far as 20 inches from his eyes.

Diplopia.

In making an examination for the existence of diplopia (double sight), the person whose sight is to be tested should be taken into a dark room, and his head fixed in one position during the examination. A candle should then be held some 6 or 8 feet from the individual; the light being moved in different positions, a double image will be seen. If a deeply-coloured glass be held first before one eye and then before the other, the coloured flame will indicate the direction of the image in the eye which deviates from its fellow.

Defects in acuteness of vision arising from other causes than those of errors of refraction, are for the most part

recognized by means of the ophthalmoscope ; such as opacities of the media, or changes in the normal condition of the fundus of the eye. In such cases, however, the use of glasses will hardly bring the vision up to the normal standard. Whatever the defect in vision, the examining medical officer should clearly define its precise degree and nature. In doubtful cases, the eyes should be examined when fully under the influence of atropine or of homatropine.

Method for Testing Colour-Vision.

Holmgren's wools are the most convenient test for colour-vision, and if employed in a systematic manner are certain to detect any defect. The plan consists in making the candidate match certain test-colours from the heap of wools.

There are three tests ; the first detects those who have any defect, while the other two determine its character.

The wools being placed on a table in a good light, the examiner selects for Test I. a pale but bright green skein, and asks the candidate to select other skeins which match it ; if he do so correctly he has normal colour-vision, and no further steps are necessary ; should he, however, select one of the confusion colours (rose, salmon, grey, straw, red, or buff) he is colour-blind ; and to ascertain the nature of the defect, place in his hands Test II., which is a rose-coloured skein ; if he select blue or violet he is red-blind, but should he take green or grey then he is green-blind.

To confirm the above, Test III. is applied by placing in the candidate's hand a bright red skein, when, if red-blind, he will chose green and brown of a darker shade than the test-colour, whereas, if green-blind, he will take bright greens and browns of a lighter shade.

REGULATIONS FOR CANDIDATES FOR COMMISSIONS IN THE ARMY.*

The following will be substituted for paragraph 1013*b*, added to the Regulations for the Army Medical Department by Clause 53, Army Circulars, 1887.

Letters and numbers corresponding to Snellen's Metrical Test-Types (Edition 1885) will be used for testing the standard of vision.

If a candidate's vision, measured by Snellen's test-types, be such that he can read the types numbered D. = 6 at 6 metres or 20 English feet, and the types numbered D.=0·6 at any distance selected by himself, with each eye separately and without glasses, he will be considered fit.

If a candidate cannot read with each eye separately, without glasses, Snellen's types marked D.=36 at a distance of 6 metres or 20 English feet, *i.e.*, if he do not possess one-sixth of Snellen's standard of normal acuteness of vision, although he may be able to read the types D.=0·6 at some distance with each eye, he will be considered unfit.

If a candidate can read with each eye separately Snellen's types numbered D. = 36 at a distance of 6 metres or 20 English feet, without glasses, but cannot read them beyond that distance, *i.e.*, if he just possesses one-sixth of normal acuteness of vision, and his visual deficiency is due to faulty refraction, he may be passed as fit, provided that, with the aid of correcting glasses, he can read Snellen's type D. = 6 at 6 metres or 20 English feet, with one eye, and at least Snellen's types D.= 12 at 6 metres or 20 English feet, with the other eye; and, at the same time, can read Snellen's type marked D.= 0·8 with one or both eyes,

* Army Circular, dated War Office, Sept. 1, 1887. These regulations apply to all branches of the Service, including the Medical Department.

without the aid of glasses, at any distance the candidate may select.

Squint, inability to distinguish the principal colours, or any morbid condition, subject to the risk of aggravation or recurrence in either eye, will cause the rejection of a candidate.

ROYAL NAVY.

1. A candidate is disqualified unless both eyes are emmetropic. The candidate's acuteness of vision and range of accommodation must be perfect.

2. A candidate is disqualified by any imperfection of his colour sense.

3. Strabismus, or any defective action of the exterior muscles of the eyeball, disqualifies a candidate for the Royal Navy.

THE HOME CIVIL SERVICE.

With reference to the Home Civil Service, the Commissioners refer each case to "a competent medical adviser, leaving him to apply whatever tests he may deem suitable, and whatever standard the particular situation may require."

THE INDIAN CIVIL SERVICE

(Covenanted and Uncovenanted).

1. A candidate may be admitted into the Civil Service of the Government of India, if ametropic in one or both eyes, provided that with correcting lenses the acuteness of vision be not less than $\frac{6}{9}$ in one eye, and $\frac{6}{6}$ in the other; there being no morbid changes in the fundus of either eye.

2. Cases of myopia, however, with a posterior staphyloma, may be admitted into the service, provided the ametropia in either eye do not exceed 2·5 D., and no active morbid changes of choroid or retina be present.

3. A candidate who has a defect of vision arising from nebula of the cornea is disqualified, if the sight of either eye be less than $\frac{6}{12}$; and in such a case the acuteness of vision in the better eye must equal $\frac{6}{6}$, with or without glasses.

4. Paralysis of one or more of the exterior muscles of the eyeball disqualifies a candidate for the Indian Civil Service. In the case of a candidate said to have been cured of strabismus by operation, but without restoration of binocular vision, if with correcting glasses the vision reach the above standard (1), and if the movement of each eye be good, the candidate may be passed. The same rule applies to the case of unequal ametropia without binocular vision, both eyes having full acuteness of vision with glasses and good movement.

Candidates for admission into the following Departments come under the rules laid down for the Civil Service :— Ecclesiastical, Education, Salt, and Opium.

Candidates for the Departments of Public Works, Forest, Survey, Telegraph, Railway, Factories, as well as Police, and various artificers, may be admitted into the service under the following rules :—

1. If myopia in one or both eyes exist, a candidate may be passed, provided the ametropia do not exceed 2·5 D., and if with correcting glasses, not exceeding 2·5 D., the acuteness of vision in one eye equal $\frac{6}{9}$, and the other $\frac{6}{6}$,

there being normal range of accommodation with the glasses.

2. Myopic astigmatism does not disqualify a candidate for the service, provided the combined spherical and cylindrical glasses required to correct the error of refraction do not exceed − 2·5 D.; the acuteness of vision in one eye, when corrected, being equal to $\frac{6}{6}$, and in the other eye $\frac{6}{9}$, together with normal range of accommodation with the correcting glasses, there being no evidence of progressive disease in the choroid or retina.

3. A candidate having total hypermetropia not exceeding 4 D. is not disqualified; provided, the sight in one eye (when under the influence of atropine) equal $\frac{6}{9}$, and in the other eye equal $\frac{6}{6}$, with + 4 D., or any lower power.

4. Hypermetropic astigmatism does not disqualify a candidate for the service, provided the combined lens required to cover the error of refraction do not exceed 4 D., and that the sight of one eye equal $\frac{6}{9}$, and the other $\frac{6}{6}$, with or without such a lens.

5. A candidate having a defect of vision arising from nebula of the cornea is disqualified if the sight of one eye be less than $\frac{6}{12}$. In such a case the better eye must be emmetropic and possess normal vision. Defects of vision arising from pathological or other changes in the deeper structures of either eye, which are not referred to in the above rules, may exclude a candidate from admission into the service.

6. A candidate is disqualified if he is unable to distinguish the principal colours (Achromatopsia).

7. Paralysis of one or more of the exterior muscles of the eyeball disqualifies a candidate for the service.

Candidates as guards, engine-drivers, signal- and pointsmen on the Indian railways, come under the rules prescribed for the Pilot Service.

Persons entering the Government Service on special duty must possess such an amount of acuteness of vision as will, without hindrance, enable them to perform the work of their office for the period their appointment may last.

THE INDIAN MEDICAL SERVICE

(Covenanted and Uncovenanted).

1. A candidate may be admitted into the Indian Medical Service if myopic to the extent of 5 D., provided that with correcting lenses his acuteness of vision in one eye equal $\frac{6}{12}$, and in the other $\frac{6}{6}$, there being no morbid changes in the fundus of the eyes. Cases of myopia, however, with a posterior staphyloma, may be admitted into the service, provided the ametropia in either eye do not exceed 2·5 D., the acuteness of vision with correcting glasses being equal to the above standard, no active morbid changes of choroid or retina being present.

2. Myopic astigmatism does not disqualify a candidate for the service, provided the combined spherical and cylindrical glasses required to correct the ametropia do not exceed — 5 D.; the acuteness of vision in one eye when so corrected being equal to $\frac{6}{12}$, and in the other eye $\frac{6}{6}$; the accommodation being normal with the correcting glasses, and no progressive morbid changes of the choroid or retina being present.

3. A candidate having total hypermetropia not exceeding

5 D. is not disqualified for the service, provided the sight in one eye (when under the effect of atropine) equal $\frac{6}{12}$, and in the other $\frac{6}{6}$, with + 5 D. or any lower power.

4. Hypermetropic astigmatism does not disqualify a candidate for the service, provided the combined lens required to correct the total hypermetropia do not exceed 5 D. The acuteness of vision in one eye must equal $\frac{6}{12}$, and in the other $\frac{6}{6}$, with or without the correcting glass.

5. A candidate may be accepted with a faint nebula of one cornea, reducing the vision to $\frac{6}{12}$, provided the eye in other respects be healthy. In such a case the better eye must be emmetropic and possess normal vision. Defects of vision arising from pathological or other changes in the eye, which are not referred to in the above rules, may exclude a candidate for admission into the Indian Medical Service.

6. A candidate is disqualified if he cannot distinguish the principal colours, red, green, violet or blue, yellow, and their various shades (Dischromatopsia).

7. Paralysis of one or more of the exterior muscles of the eyeball disqualifies a candidate for the Indian Medical Service.

THE INDIAN PILOT SERVICE.

1. A candidate is disqualified unless both eyes are emmetropic, his acuteness of vision and range of accommodation being perfect.

2. A candidate is disqualified by any imperfection of his colour sense.

3. Strabismus, or any defective action of the exterior muscles of the eyeball, disqualifies a candidate for the Pilot Service.

THE INDIAN MARINE SERVICE

(Including Engineers and Firemen).

1. A candidate is disqualified if he have an error of refraction in one or both eyes which is not neutralized by a concave, or by a convex 1 D. lens, or some lower power.

2. A candidate is disqualified if he cannot distinguish the primary colours and their various shades, red, green, violet or blue, and yellow.

3. Strabismus, or any defective action of the exterior muscles of the eyeball, disqualifies a candidate for the Marine Service.

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